The Scajaquada Creek Drain

Buffalo, N. Y., Is Doing Away with a Public Nuisance Through the Construction of an Underground Drain

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THREE years ago, at a general election, the people of Buffalo declared the Scajaquada Creek a public nuisance and voted in favor of having a large portion of it—that which flows through the east side residential district—converted into an underground drain. This, in substance, is now being taken care of.

The Scajaquada Creek proper flows through the entire north side of the city. Estimated approximately, the length is about six miles. The creek pursues a winding, diagonal course from east to northwest, emptying into the Niagara River. It serves as a non-sewerage drain to the adjacent territory, taking care of the outlying east side especially, where, because of land development, modern drainage has not yet been installed.

In accordance with the wishes of the people, action was begun on this underground drain at once. A survey was made, plans were drawn up and bids let, and the work started the following spring. Experts reckoned it a hard job, made difficult through the various obstacles to be overcome. Chief among these were the water and the rock problems. Hard, compact limestone was encountered just below the surface of the creek-bed. The drain itself, or rather that portion of it now under construction, is 6,000 feet long. And the average depth of rock to be excavated is 8 feet.

THE END OF THE FINISHED ARCH OF THE SCAJAQUADA CREEK DRAIN

The water problem presented was to take care of the normal water flow while construction was going on. For the most part, pumps were used which drained this water into city sewers; for the rest, it was found necessary to cut through the strata of rock in such a way that there would be a continual channel through the broken stone refill. Of course, in wet weather this rock work had to be suspended until the water subsided.

The drainage area of this creek is 22.40 square miles. During the summer months, the volume of water handled is very slight,

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but during the wet season the depth increases to as much as 8 feet. Estimating the width of the creek-bed at 45 feet, one appreciates that the volume of water carried by this creek is considerable.

In drawing up the plans for this work, Metcalf & Eddy, consulting engineers, of Boston, Mass., after carefully studying the project, submitted a report on three different types of drains as practicable for a work of this kind. The first type called for a dish-bottomed drain with side-walls, but no roof. This type was not recommended, and the city rejected it, as scum and refuse would collect on the surface of the open water in warm weather; also, the drain would form a breeding ground for mosquitoes. It would also have been necessary to bridge all street crossings for traffic purposes, thus entailing further expense.

The second type considered was a flat-bottomed drain with side-walls and arched roof. The dimensions of this drain were considerably smaller than those of the first type, and it necessitated a detention basin covering, say, 500 acres of land at the upper end to take care of the abnormal flow of water, which this drain was incapable of handling during the wet season. The expense of buying the land to construct this basin would bring the total cost of this type of drain up to that of the third type. The city therefore rejected the second project as unsuitable.

The third project called for a flat-bottomed drain with side-walls and roof-arch similar to that of the second type, only larger. This type of drain was to be 14 feet high from the floor of the center of the roof-arch. The average width was 28 feet, and in some places it ran as wide as 33 feet. This drain is capable of handling a water flow of 5,600 cubic feet per second past a given point. This capacity was chosen after a careful study of rainfalls and flood flows, with the intention of making it adequate for such a flood as would probably occur about once in 25 years, after the district has reached such a point of development as it may attain in about 25 years. With the development in its present status, the critical flood would probably be met only once in 50 or 100 years. This is the drain selected by the city of Buffalo for Scajaquada Creek.

BUILDING THE SCAJAQUADA CREEK DRAIN IN FLORIDA STREET, BUFFALO

Bridges Eliminated

This drain does away with all bridges. In the present section under construction, six bridges have been removed, one of these a splendid, three-arch, massive stone structure which carried Humboldt Parkway. All streets crossing the new drain will be laid down over the arch, which will be constructed to sustain a load of 1,000 pounds per square foot, including its own weight.

The Buffalo dredging Company, contractors, are in charge of the construction of the new drain. They are using the best materials obtainable, every lot or shipment received

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being thoroughly tested several times before being used. For the concrete work, Pennsylvania portland cement is being used, the testing of which is in charge of the R. W. Hunt Company. All steel used is tested by the Pittsburgh Testing Laboratories.

The side-walls and roof of this drain are of concrete, reinforced with two rows or layers of ¾-inch bars. These bars run horizontally as well as vertically, and where they cross each other are securely wired together so as to be held in place till the concrete is poured. On the top of the arch, about 9 inches separates the layers of iron reinforcement. In the side-walls, about 14 inches separates the rows of iron work. The arch throughout was designed for unusually heavy loads because of the probability of street crossings in locations which could not be foreseen, and also because of the possibility of the storage of heavy material over the drain in certain localities. The thickness of the concrete in the roof-arch is 12 inches at the center, sloping out to 21 inches near the side-walls. The side walls are 18 inches thick, and are backed up by a solid, natural wall of limestone. The floor is of smoothly finished concrete, laid directly on the rock, the smoothness of the floor facilitating the flow of water by offering no obstacle on which sediment or silt can gather.

A CONSTRUCTION SCENE IN THE SCAJAQUADA CREEK DRAIN DURING WET WEATHER

To fit the topography, the slope of the lower section of the conduit was made .0017 on tangents, and compensation for curvature amounting to .001 additional was provided on curves. In this section of the conduit, the velocity at times of flood discharge is expected to be about 15 feet per second, and under high velocities the loss of head due to curvature is known to be considerable. The upper section, construction of which has not yet been begun, will be built on a slope of .0008 on tangents and .0011 on curves. In this section, the maximum velocity will not exceed 11 feet per second.

The increase in velocity at the change of grade will involve a loss due to the additional velocity head required. This has been provided by a drop in the conduit, to be accomplished in a distance of 50 feet horizontally.

The capacity of the conduit, as designed, varies from 3,130 cubic feet per second at the upper end, to 5,620 cubic feet per second at the lower end, the total length being 15,380 feet. The drainage areas tributary to the creek are 16.15 square miles at the upper end of the conduit, 22.40 at the lower end, and 23.95 at the mouth of the creek.

In the slope or grade given this drain, the amount of rock excavation was kept as low as possible; at the same time, sufficient cover was provided so that the arch might be protected and the small water pipes and drains could be laid below the surface. All large water-mains and sewers that cross this drain will be raised and laid on the top of the arch, and will then function by the siphon method.

Manholes are provided at street crossings, giving access to either end for entrance. Weepers of 5-inch vitrified pipe are provided every 50 feet at the level of

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the bottom of the side-walls, to take care of water seepage through walls.

The forms used in the construction of the concrete arch are of the movable type —on wheels and tracks. They are of steel and can be moved as the work progresses. In constructing the side-walls, steel forms were used, while for the overhead arch work the top surface of the forms was of wood. The wooden forms are well oiled, and the seams where the sections of the forms join together are covered with strips of thin sheet-iron to prevent the fresh concrete from leaking through. Once the concrete is set, these forms can be loosened, dropped down and run out from under the arch.

Considerable curvature necessarily enters into the location of this drain. With but six exceptions, the deflections have been made with curves of 210 feet radius; and most of them represent changes in direction considerably less than 90 per cent. The six exceptions are: 95 feet radius, 110 feet, 146 feet, 154 feet, 260 feet, and 260 feet.

One portion of the old creek, approximating 1,200 yards, formerly ran a crooked course parallel to Florida Street. At one end, this creek ran directly alongside the street, and at another point it was over 100 feet from the street. The engineers, in laying out the course of the new drain, saw here a chance for improving the new course over the old one; so instead of following the course of the old creek-bed, they made a new course directly through Florida Street. The street was dug out and the new arch-drain built within it. The old water-course was then filled in,, thus making additional land available for the use of the abutting property owners, should the city so authorize.

The cost of this drainage work is rather high on account of the existing market prices of materials and labor. In view of this, the city decided to divide the Scajaquada Creek job into three—possibly four —sections, and to proceed with the construction of each section as the financial condition of the city allows. The money to defray the expense of this improvement is to be raised by taxation, general or local, to be decided by the city authorities at a later date. In the meantime, the work on the first section is nearing completion— 6,000 feet of underground drain, built at a cost of $1,449,000.

Rubber Roads Invented in England

Special Type of Rubber Block Pavements Developed for Traffic Running on Rubber Tires

A NEW type of rubber composition paving block has been developed in England which it is claimed can be placed on the market at a price to compete with the ordinary creosoted wood block, when it is taken into consideration that the composition blocks are noiseless and have an estimated life of 15 years. Two types of blocks have been produced, one made with a core, surfaced with a ½-inch hard vulcanized rubber, and a second consisting of the core only. The principal ingredients of the core, which have been patented, are rubber, jute, and china clay. These ingredients enable the whole block to be vulcanized in one piece, as it has been found by experiment that the block should be a solid mass and not made up of separate superimposed portions. When the block has been hollowed out and filled with concrete or wood to reduce cost, it has been found that the rubber surface creeps and shows wear on the underside at the place of contact and not on the surface.

In an experiment with a wooden block upon which a steel plate was placed as a seat for a rubber surface, it was found that the heavy traffic turned up the steel plate at the edges. At St. Pancras railway station, London, the covered way under the hotel is surfaced with a sheet of rubber of about ½-inch thickness. It is claimed that there is a tendency for the rubber sheet to "lick up," so that it must be pegged down from time to time. As a result of their experiments, manufacturers have decided that the separate solid blocks give the best results. The block proposed is similar to the wooden block used ordinarily for street paving, and measures 9 x 4½ x 3 inches.

Up to the present time it has not been possible to manufacture rubber blocks at less than three times the cost of wood paving, which is about $5.40 per square yard. The Gould block core is claimed to be made at 4 cents per pound, and it is expected that the price of paving will not be more than $13.34 per square yard.

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